GAS JOURNAL, OCT. 16, 1946

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A PICTURE OF THE GAS INDUSTRY

THE immense and pressing need for economy in the use of fuel of every sort induced the Fuel Efficiency Branch of the Ministry of Fuel and Power to call a Conference of a magnitude that seems to be paralleled in the scientific world only by the British Association or the World Power Conference It is a tribute to the work of the Fuel Efficiency Branch that over 4,000 well-known industrialists applied for tickets. Nearly 200 papers were given on every imaginable subject of fuel utilization, which would appeal to what may be termed the ordinary industrial user. The spate of technical oratory was such that one feels that there can never be another such conference for there can be little left to say. Repetition is the soul of successful propaganda, however, and we do not doubt that it will be repeated in due course.

"Carbonization," said Mr. Whitehead in the first sentence of his Address to the conference, "is the most efficient known method of processing coal." It was natural, therefore, that the Gas Industry and the Coking Industry should be well represented at the gathering. Special sessions of Section E: "The Carbonization and Chemical Industries," were set aside for each of these branches of a very healthy tree, and the opportunity was taken to tell the world something of the way in which these industries have promoted fuel efficiency, and of their plans for the future. Since this was essentially an industrial section of the conference, the emphasis was placed upon the manufacture of gas and its industrial uses; there was a later section, however, dealing with the home and its fuel services, and here, too, the point of view of town gas was put forward.

The story unfolded is, of course, well known to those in the Gas Industry. It is well that we should ourselves be reminded from time to time of elementary facts. The Industry, on the whole, is efficient and has been fundamentally so for a long while. But the standard of efficiency must vary in any industry from place to place. The variation may be due to the policy of the board of directors or of the gas committee of a municipality. Some boards and gas committees are averse to spending money when it is needed, and the gas undertaking is starved in consequence. There are those who declare that there is no need to advertise gas; let people have it if they want it, but do not force it on them. There are directors and gas committees who do not take the necessary interest in their works. Whatever may have been the reason, there were, in 1939, works that were below the standard required to carry the heavy burden of war. It was Mr. Whitehead's thesis that the particular form of self-help represented by the Regional Gas Engineering Advisory Boards came to the rescue of these weaker brethren early in the war, and successfully carried every undertaking through the perils that beset the Industry.

Mr. Whitehead's summing up of the work of these Boards leaves the reader, whether he be layman or gas engineer, in no doubt as to their success. "The maintenance of gas-works efficiency under the adverse conditions of a long war represents a substantial saving of coal when compared with the falling-off which might reasonably have been expected, and there is no doubt that this is largely due to the splendid team work and co-operation which have existed between gas engineers generally and the Regional Gas Engineering Advisory Boards. If we can effect such a saving under these conditions, how much more might we save in the more normal conditions to which we are slowly returning. This thought has led us to decide that the Board's activities shall continue." The achievement of the Boards was the maintenance throughout the country of the Overall Thermal Efficiency of carbonization on nearly every works at over 76%. That means that after allowing for the heat and power required for the manufacturing process, 76% of the thermal value of the coal charged into the retorts was obtained in the form of saleable product—gas, coke, tar, and benzole. For no less than 72% of the coal carbonized in gas-works, the average was practically 80%. It is not surprising that Mr. Whitehead can report that, "in view of the Co-ordinating Committee, and I believe also of the Ministry of Fuel and Power, the efficiencies of gas manufacture throughout the country have been maintained through a very difficult period to a surprising degree." We would go further and suggest that the Boards in the course of their work have tuned up many a gas undertaking to a higher pitch of efficiency than had previously been obtained. The quality of gas coals has deteriorated; many coals are still in use that are not normally classed as gas coals; the ash content of the coke used in the producers has soared; labour has been scarce; maintenance has been dangerously reduced because neither the labour nor the materials were available; plant has been over-loaded. Yet, in spite of all these difficulties the Fuel Efficiency Index has been maintained almost everywhere at a satisfactory figure. The Regional Boards are greatly to be congratulated on their achievement. The Gas Industry is equally to be congratulated upon their retention.

The future is not without its technical problems, however, Mr. Whitehead asks for still further improvements in design. These improvements are "particularly in regard to producers, recuperators, and the insulation of retort settings, and this is largely a function of the plant designers and builders." In this, Mr. Whitehead is speaking to the converted. The plant designers are well aware of their problems and of how to solve them. It is necessary for gas engineers to be bold in undertaking innovations and for boards and gas committees to sanction increased expenditure to secure increased efficiency. The Fuel Efficiency Campaign has shown quite clearly that *it always pays to have the best.* Most gas engineers are fully convinced of that; but there are sometimes those in control who have to be convinced that true efficiency, either technically or in a business sense, does not consist in accepting the lowest tender. The disposition to do so is one of the major weaknesses of the municipal system.

On the technical side, we believe that there is yet much to be done in the Gas Industry in utilising steam and waste heat properly. Another lesson of the fuel efficiency campaign has been that in industry generally far greater economies of fuel can be secured by proper utilization of steam than by attention to combustion. The Gas Industry might with advantage investigate the utilization of steam with a view to putting into effect the increased use of pass-out or exhaust steam for such purposes as low pressure steam can be used.

The personnel problem looms largely before the Industry. Mr. Whitehead maintains that more properly trained technical men should be employed within the Industry. There is the difficulty that seems to have arisen suddenly in every industry of too few trained men. The Gas Industry is essentially a technical industry; it has comparatively little room for professions other than those of the engineeer and the chemist, and its work has no such general appeal that recruits flock to its doors. It is needful that the world shall know that the Gas Industry is on the verge of great developments, that it is a modern industry for all its century and a quarter of vigorous life, and that there are within the Industry satisfactory possibilities of advancement. A strong and continuous effort is needed to make this widely known.

GAS ENGINEERS' NATIONAL GUILD

BY the end of last month well over 400 applications had been received for membership of the Gas Engineers' National Guild. The Interim Committee is pleased with the response which has so far been made since the Prospectus was issued. At the same time the Committee feels sure that many more members of the Institution of Gas Engineers will be desirous of joining the Guild—the aim, of course, being 100% membership. One of the many objects of the Guild is to safeguard the interests of those professionally engaged in the Gas Industry and those interests comprise salaries, existing contracts, compensation for loss of office, pensions, and so on. The Guild is desirous of advising or assisting those engaged in the Industry who may be affected by change of ownership and who at present may be precluded from taking up membership of our organization. We are informed that it is intended to call a meeting of all members of the Guild during the week when the Autumn Research Meeting of the Institution of Gas Engineers is held in London (November 27-28). It is hoped that at this meeting a draft Constitution and Rules will be submitted to the members for their consideration and approval.

We referred last week to the comments of Sir John Dalton to the North Western Fuel Luncheon Club. He was thinking not of the gas engineer but of the whole body of fuel technologists, particularly those employed in the electricity industry. Sir John painted a somewhat rosier picture of the present controllers of his own industry than might be thought justifiable. It may be true that the "guinea pig" is disappearing from the boards of electric supply companies, but it is not, we think, true that there is any marked tendency for technical men to increase their membership of municipal committees. If the Trades Union are filling up the new national and regional boards they are still more strongly represented on municipal bodies of all kinds.

Sir John made two points of which we should take particular note. One is that the Trades Unions are rapidly growing into the position of, as he put it, a Third Estate of the Realm and the other, more serious, that there is a risk that the salaries of technical personnel will tend to fall to that of the existing Scientific Officer of a Government Department. The latter risk is reinforced by another, that promotion by ability may gave way to grading and seniority.

These are real risks. We think the answer to the first is that technical men must form themselves into strongly organized professional bodies. The answer to the second risk is, as we indicated last week, that the scale of salaries must be studied and worked up into a clear cut, unambiguous Code based on present day values and conditions. Here is a task before the new National Guild.

Voluntary Rationing

Opening the "Fuel and the Future" conference and exhibition at Westminster last week, Mr. Shinwell called for an all-round voluntary saving of 10% in the consumption of coal, gas, and electricity. It is a bleak outlook both for domestic consumers, who are using millions of tons of coal less each year than in the years immediately before the war, and for industries which have already responded loyally to earlier calls for fuel economy, but the Minister had to confess that the fuel position is such as to demand a reduction in consumption. The alternatives were to step up at once our efforts to economize or to face in the depth of the coming winter a breakdown in supplies. "I believe I am not asking the impossible," said Mr. Shinwell, "for I know how dramatic have been the results of your previous efforts. I recall how great were the savings in 1944 and 1945, when it became essential to impose economies by direction. This saving of 10% is needed in coal, gas, and electricity, and must apply to all consumers, not only in industry but also in the home and in public and commercial undertakings. Lest there be any misunderstanding, let me say at once I am not proposing to reduce the allocations of coal to domestic consumers: I look to them for savings in the form of gas and electricity. Since domestic consumption of gas was 26% higher in 1945 than in 1938, while with electricity the increase was 65%, I feel sure the domestic consumer can and will respond."

Diary

Oct. 17.—Solid Smokeless Fuels Federation: Executive Committee, 11.30 a.m., Dorchester Hotel, Park Lane, W.1.

Oct. 17.—Midland Association of Gas Engineers and Managers: Autumn General Meeting, King Edward House, Birmingham, 2.30 p.m.

Oct. 18.—Gas Companies' Protection Association: Committee Meeting, 5, Victoria Street, S.W.1, 2.30 p.m.

Oct. 18.—Manchester District Association of Gas Engineers. Paper by H. Johnston, Bradford. Town Hall, Morecambe, 11 a.m.

Oct. 21.—London and Counties Coke Association: Finance Committee, 10.30 a.m.; Executive Committee, 11 a.m.; Central Committee, 12 noon; Annual Luncheon, 1 p.m. for 1.15 p.m.; Annual General Meeting, 2.45 p.m. Grosvenor House, Park Lane, W.1.

Oct. 22.—Southern Association of Gas Engineers and Managers (Eastern District): "The Application of the Lockheed Principle to the Automatic Operation of a C.W.G. Plant," J. C. Herbert. Gas Industry House, 2.30 p.m.

Oct. 23.—Wales and Monmouthshire Junior Gas Association: Annual General Meeting, Mackworth Hotel, Swansea, 3.15 p.m.

Oct. 24.—Midland Junior Gas Association: Visit to the Yorkshire Copper Works, Leeds.

Oct. 25.—North of England Gas Managers' Association: Autumn General Meeting, Sunderland. Visit to Hendon Works, 11.15 a.m.; President's Luncheon, Seaburn Hotel, 1 p.m.; Meeting, 2.30 p.m. Visit to Wear Glass Works, 3 p.m.

Oct. 29.—Southern Association of Gas Engineers and Managers: General Committee, 11 a.m. Luncheon, 12.30 p.m. Annual General Meeting and Presidential Address, Frank Dawson, 2 p.m. Grosvenor House, Park Lane.

Nov. 1.—London and Southern District Junior Gas Association: "Steaming Efficiencies in Intermittent Vertical Chambers," R. Whiting. Gas Industry House, 7 p.m.

Nov. 2.—Scottish Junior Gas Association: Visit to New Grange Works of Alder & Mackay, Ltd.

Nov. 11.—Women's Gas Council: Executive Committee, Gas Industry House, 1 p.m.

Nov. 12.—Midland Junior Gas Association: Meeting at Wolverhampton. Film, "Steam," &c.

Nov. 12.—British Gas Council: Central Board. Gas Industry House, 2.30 p.m.

Nov. 13.—Institute of Fuel (North Western Section): "The Distribution of Ash in British Coals and its Bearing on the Economics of Coal Cleaning," Dr. E. S. Grumell Manchester, 2.30 p.m.

Personal

Mr. LAURENCE NICOL, of Greenock, has been appointed Engineer and Manager of the Millport (Bute) Gas Department, in succession to Mr. J. DYMOCK, who is retiring shortly.

* * *

News reached us as we went to press that Mr. GEORGE HELPS, Engineer, Manager, and Secretary of the Nuneaton Gas Company, has retired from the Board. His son, Mr. GEORGE HELPS, JUNR., who has been associated with the Company for 34 years (the last 20 years as Assistant Engineer and Manager), has succeeded him as Engineer and Manager.

* * *

Mr. LEOPOLD FRIEDMAN, Managing Director of De La Rue Gas Development, Ltd., has been appointed to the Board of Thos. De La Rue, Ltd. This implies added responsibility, but at the same time added capacity to aid the Gas Industry in its future problems—and, as is well known, for many years now his ability has helped greatly to advance the technical efficiency and practical application of gas in the water heating field.

Obituary

The death has occurred of Mr. F. C. HUMPHRYS, who was Engineer and Manager of Ilkeston Gas Company for 52 years. He retired in 1931 and was 92 years of age.

* * *

The death occurred on Oct. 10 of Mr. L. MARSHALL, of Leeds, who, had he lived until next year, would have completed 60 years' service with Messrs. James Stott & Co. (Engineers), Ltd., manufacturers of hotel, restaurant, and canteen equipment. Mr. Marshall had for many years been manager of the Leeds branch of the Company, and for the past year or two had carried on in semi-retirement.

Letter to the Editor

Scientific Control of Gas-Works

DEAR SIR,—I have read with considerable interest the Paper by Mr. Mr. Alexander McFayden published in your Oct. 2 issue, and am sure all your readers will agree that congratulations are due to the Author both on his results at Dumbarton and also on the clear way they are expressed in the Paper.

I would like to raise three points.

First, can the Author give the annual average ash content of coals carbonized on a tonnage basis, saying how many tests go to make up the average? These figures will be interesting as a guide to producer results.

Secondly, is an ample supply of cold cooling water available for the condensers, as this is essential to good gas making?

Thirdly, what technical staff at the works contributed to these results, and what are their salaries? It would be interesting to know this in order to see that the staff at Dumbarton as well as consumers benefited by these excellent working results.

Yours faithfully,

K. L. CLARK.

21, Southcroft Avenue,
West Wickham,
Kent.
Oct. 7, 1946.

Eastern District Tar Board

Mr. J. Hunter Rioch presided at the annual meeting of the Eastern District Tar Board of the British Road Tar Association at Cambridge on Sept. 30, at which Mr. W. E. Cone, Technical Adviser to the Association, said it was hoped in the near future to take a big step forward in the improved application of the technique of road making. Everything was being done to ensure that the road improvement programme planned by the Government was adequately met as far as tar was concerned.

Mr. J. Davidson Pratt, Chairman of the Association, in a short address, said the broad object of the Association was to try to improve the quality of road tar.

Proposing the toast of "The Guests" at a luncheon which followed the meeting, Mr. Hunter Rioch said the roads of this country were second to none, and their condition to-day after six years of war, with all the restrictions imposed by shortage of labour and materials, was a tribute to the care and skill with which they were built and maintained by their surveyors and staffs.

Mr. A. E. Peake, Surveyor to the Cambridge County Council, in reply, said the present condition of our roads since the advent of motor vehicles had been largely brought about by the use of tar.

Following the toats, Mr. W. E. Cone presented his Paper on "Tar Surface Dressings," to which editorial reference was made in the "JOURNAL" of Oct. 2.

Gas and Electricity Co-operation

In his Address as Chairman of the Devon and Cornwall Sub-Centre of the Institution of Electrical Engineers, Mr. H. C. Widlake said that the increasing use which gas undertakings are making of electricity supply services tends to bring the engineering officers of the two industries into close association with one another. "For many years they have co-operated in matters concerning the safety of the consumer, and in this connexion my activities warrant my speaking with assurance. My experience is that, in all matters calling legitimately for joint action, the relations between the officers of these two great industries are good, sincere, and characteristically British.

"Within the existing limits of our knowledge both the electrical and the gas industry serve a definite purpose in our national life, and the plants of both are loaded to capacity by their respective commitments. The engineering officials of both services are joint trustees for the comfort and personal safety of the public they serve. In the war years, in times when every path was one of danger, the servants of both industries walked paths of peculiar and particular peril. . . . I like to think that no circumstance of commercial rivalry can ever destroy the bonds of fellowship forged by a common danger, faced in a common cause."

North-Western Fuel Luncheon Club

Sir Frederick J. West presided at the first meeting of the second annual session of the N.W. Fuel Luncheon Club in Manchester. The guest speaker was Sir John Dalton, Director and General Manager of the County of London Electricity Supply Company and President of the Fuel Luncheon Club, London. He spoke of Fuel Technologists and Nationalization, and his remarks have already been commented on in the "JOURNAL."

He welcomed the Charter which had just been granted to the Institute of Fuel, which recognized the status of the fuel technologist on a professional basis. He thought the charter had come just at the right time when so many men may find themselves under new conditions of engagement and employment; men who were likely to be met with a cheese-paring policy regarding salaries and the deadening formula of grading and seniority which is so much in the forefront of all posts connected with the State.

The Club held its annual general meeting, at which Sir Frederick West consented to be elected President for the second year. Three of the Vice-Presidents, Mr. Miles K. Burrows, Dr. Franz Kind, and Mr. R. A. S. Thwaites accepted re-election, and to their number was added Dr. A. C. Dunningham, who served as Chairman of the North Western Section of the Institute of Fuel during the war years and who was mainly instrumental in the formation of the Luncheon Club. Mr. R. Baker, the energetic Hon. Secretary, who has carried through the organization of the Club, was also re-elected by acclamation. The rest of the officers and members of the Committee were re-elected and the Rules, now finally drawn up by Mr. Baker and approved by the Committee, were adopted.

The next meeting will be held on Wednesday, Nov. 6, when Mr. Robert W. Foot will address the Club on the British Coal Industry.

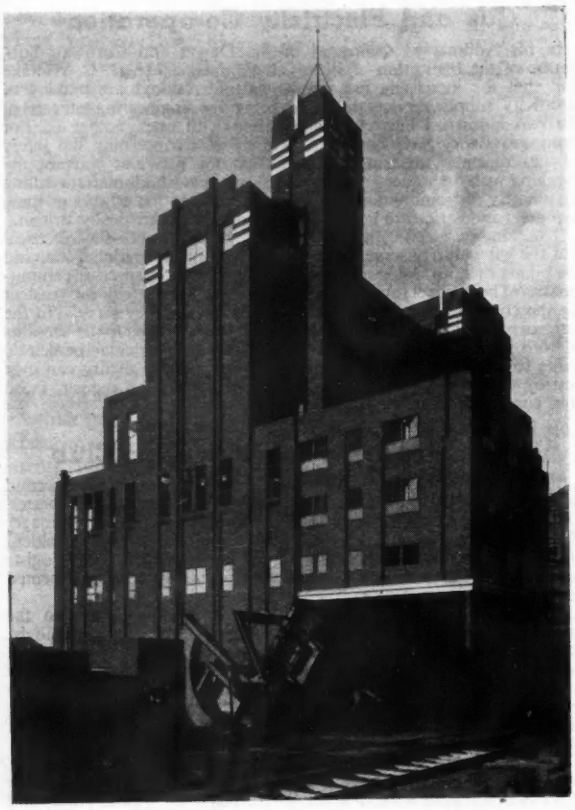
Chemical Industry in War and Peace

Sir Stafford Cripps, President of the Board of Trade, and Sir Robert Robinson, President of the Royal Society, were the principal guests at the first post-war annual dinner of the Association of British Chemical Manufacturers at Grosvenor House on Oct. 9.

Responding to the toast of "The Guests," Sir Stafford Cripps paid tribute to the contribution made by the chemical industry to the war effort. The first Great War showed how deficient was the industry as a whole and a great deal had been done to repair the deficiency before the Second War began, with the result that it was able not only to meet all principal needs but also to provide staff for administration and research. They now looked to the chemical industry to help the nation not only in the products needed for home consumption but particularly in the field of exports.

Increase of output per man employed in the chemical industry had exceeded that in other industries generally over the inter-war period, but no opportunity must be lost of further improving their efficiency of production by new devices and plant of all kinds and by better layout and use of existing plant and labour. Chemical exports this year so far averaged nearly £5,500,000 a month, compared with about £1,800,000 in 1938, which probably represented an increase of rather more than 60% by volume. That was a good beginning, but they would have to go much further, for they looked to the industry as one that could give more than the average 75% increase by volume that the nation needed.

Judging by their expansion between the wars and during the war, and the skill and ingenuity their scientists and engineers had shown in improving production processes and in introducing new manufactures, the Government looked to them confidently to assist the nation in building up and maintaining against whatever competition might come a sufficient volume of exports to enable them to import the food and raw material they needed, at the same time keeping their own manufacturers and consumers fully supplied.



Woodall-Duckham Retorts at Lincoln*

THE new installation comprises one bench containing 16 latest type lambent heated Woodall-Duckham continuous vertical retorts and is capable of carbonizing 138 tons of coal and of producing 2,152,000 cu.ft. of gas a day. The retorts are heated by hot producer gas made in a battery of four step-grate producers situated at ground floor level at one side of the bench. The installation is provided with a complete coal and coke handling and coke screening and storage plant, and with a waste heat boiler, and is erected in a new steel-framed brick-panelled building of modern design.

Retort Design and Heating System

The retorts are about 26 ft. high, rectangular in plan and tapered to allow continuous regular descent of the coal. They are 10 in. wide at the top and 82 in. long. They are arranged so that any one retort can be controlled without affecting the others, and, in addition, a transverse air-cooled division wall is built dividing the bench into two sections of eight retorts which enables either section to be let down cold for repair without interfering with the working of the other.

The retort design is such that the gases travel backwards and forwards from end to end of the retort through horizontal flues during their natural upward flow. There is only one point of admission and control of producer gas on each side of each retort, located in a readily accessible position in the setting outside wall. Secondary air is admitted to the heating flues at three or more levels and its distribution is controlled by dampers located in the same outside wall.

With this system of heating the temperature in the combustion flues is sufficiently low at the point where spalling of the silica normally takes place to allow the retorts to be constructed at this level with safety in firebrick. By the time the coal has travelled past this belt of firebrick and enters the silica portion of the retort, it has acquired a sufficient heat to avoid the extreme differences in temperature at either side of the retort wall, which are the main cause of the spalling of silica meterial at this point. A special feature of this design is the arrangement whereby the retort seating and the supporting steelwork are cooled by the circulation of the secondary air prior to its admission to the settings. Both the side walls and the top of the bench are efficiently insulated, with the double object of improving the working conditions and saving fuel.

Coal Supply to the Retorts

The coal is delivered in railway wagons to the repositioned works siding where an electrically operated wagon tippler is situated. The tippler, which is capable of handling ten 20 ton capacity wagons an hour, discharges the coal into a receiving hopper whence it is fed by means of a rotary feeder and a 30 in. band conveyor to a 100 tons per hour Jeffrey coal breaker. A screen is provided to enable the small coal to by-pass the breaker.

The broken coal, together with the small coal by-passing the breaker, is fed to a 30 in. band conveyor which, in turn, feeds it through a rotary feeder on to the lower strand of a 100 tons per hour gravity bucket conveyor encircling the end bay of the retort house. This conveyor delivers the coal on to a conveyor whence it is fed, via a shuttle band conveyor into the overhead storage hoppers above the retort bench. The plant is capable of dealing with 100 tons of coal per hour.

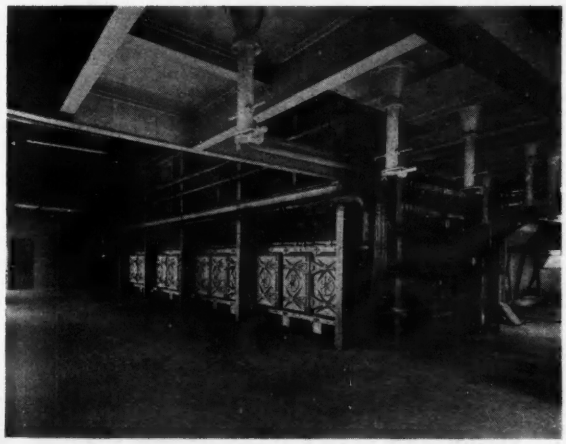
* The opening of the new plant at Lincoln by the Minister of Fuel and Power was described in our issue last week.

Group of officials and visitors who attended the opening of the new carbonizing plant at Lincoln

Mr. Emanuel Shinwell, Minister of Fuel and Power, opening the new plant. On his right is Alderman J. W. F. Hill, Mayor of Lincoln. Also on the platform were Mr. G. Wright (Engineer and Manager), Mr. G. R. Sharpley (City Sheriff), Alderman G. Deer (M.P. for Lincoln) and Councillor H. Bennett (Chairman of the Gas Committee)

Provision has been made for a duplicate gravity bucket conveyor to be installed and also for the handling of coal to the overhead storage hoppers serving the existing retort benches of the first and second installations.

With continuous vertical retorts there is a tendency for the ash liberated by steaming to attack the joints in the lower parts of the retorts, where there is no protection by scurf formation. By spraying the retort faces regularly, when the retort is empty for scurfing, around the region where this chemical action takes place, slagging of the brickwork can be avoided and the life of the retort indefinitely prolonged. In the Woodall-Duckham bottom castings specially easy access is provided for inspection and spraying without dismantling the castings.



This photograph of the producers typifies the spacious working conditions.

Gas Collecting Mains

Two collecting mains are provided, one situated along each side of the bench. The collecting mains are of the dry type, and are arranged with a fall towards a cleaning well in the centre, where heavy tarry products are removed at intervals. The mains are occasionally flushed with hot liquor. The gas passes from the collecting mains through uptakes into the foul main. In the uptakes it is sprayed with hot ammoniacal liquor, thus ensuring further cleaning. The foul main is fitted with a butterfly valve operated by an Askania regulator which regulates the pull on the retorts. To clear the gas mains of air at starting-up, or after shut-down periods, a blow-off pipe is provided. Also an automatic pressure relief valve of the Braddock type has been fitted in the main.

A closed ammoniacal liquor circuit is constituted and a regular supply of hot liquor is ensured.

Producers

Four producers are provided in a separate battery at the retort house floor level at one side of the bench. The producers are arranged so that any producer may be shut down without interfering in any way with the working of the other producers. The gas from any of the producers may be taken to any of the retorts. The producers are of the step-grate type with grate areas such that any three producers together shall have ample area for the efficient heating of 16 retorts when using a mixture of coke and breeze. The producers are worked under pressure. Hinged sealing doors are provided on the fronts of the producers and the primary air is injected by steam.

Waste Heat Boiler

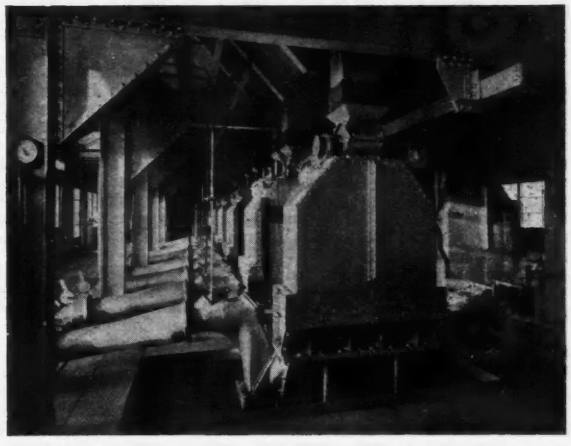
The waste heat boiler, which is of the Woodall-Duckham horizontal fire-tube induced draught type, is designed for a working pressure of 120 lb. per sq. in. It is of a size to deal with the whole of the gases from 24 retorts or with the equivalent volume of gases formed by the waste gases from the present bench of 16 retorts with producer gas augmentation. Provision is made whereby the supplementary supply of producer gas for augmentation can be burned in a special combustion flue and the products of combustion passed into the waste gas stream before it enters the boiler. In addition, in case it may be required to raise this supplementary supply to a proportion which would give rise

Good lighting and ample room at the top of the hoppers.

to temperatures which might be injurious to a boiler designed for dealing with waste gases, provision is made for the recirculation of part of the cooled waste gas leaving the boiler into the boiler inlet flue, thus lowering the temperature of the mixed gases to within safe limits.

The coke screens, the cutter, and the tops of the spiral chutes are totally enclosed to prevent the emission of dust. Full provision has been made so that at a later date a second set of coke screens and cutter can be installed.

All power operated units on the coal handling plant and the coke handling and screening plant are driven by totally-enclosed, dust-proof, gas-works-type electric motors, electrical sequence interlocks being provided to prevent these units from being started up out of their proper order. The same type of motor is used to drive the lift, water pumps, Askania regulator pumps, dust extraction fan, vacuum cleaning exhauster, and as a stand-by for the liquor pump and waste heat boiler fan. The whole of the steam required for the retorts, producers, boiler fan turbine, feed water pumps and liquor pumps is supplied



A view of the top of the retort setting, showing the gas offtakes

by the waste heat boiler and there is a surplus of some 3,000 lb. per hour for other purposes.

Working Conditions

To prevent any pollution of the air within the retort house by coke dust during the discharge of a retort, dust extraction hoods are fitted at the coke dischargers and connected by ducting to a complete dust collecting and receiving unit situated in the dust extraction house beneath the messrooms. A further dust extraction plant is provided in the coke screening house where the dust extraction hoods are positioned over the coke screens and chutes. To assist the maintenance of cleanliness, within the retort house a vacuum cleaning plant has been provided with hose coupling points distributed throughout the plant. The exhausting and dust receiving equipment for this plant are installed in the dust extraction house.

To promote air circulation under adverse atmospheric conditions eight ventilating fans are provided, four being positioned at the top of setting platform and four at the producer charging platform.

Buildings

Considerable attention has been given to the design of the buildings housing the various portions of this installation. The retort house and outside coke screening plant form integral parts of an imposing block of steel-framed brick-panelled buildings designed in accordance with the modern vertical style. It is a matter of some difficulty to house in an attractive and yet economical manner the somewhat irregular shapes combined in a completely equipped modern carbonizing plant. By careful designing and balancing of voids, wall space, and vertical features an attractive result has been obtained without departing from the functional character of the building. The portions of the lift structure and the chimney above the retort house are enclosed in brick built towers designed to harmonize with the retort house. In an annexe on the side of the retort house a messroom, a lavatory with shower and a changing room are provided for the men employed on the plant. These rooms have walls finished with cream glazed tiles and black and white unglazed floor tiles. Within the retort house a house has been built to enclose the extractor engines, liquor pumps, and boiler feed pumps. The walls of this house are finished with a dado of cream glazed tiles and the floor is similar to the messroom. Three further houses of similar design are provided within the retort house and accommodate the dust extraction and vacuum cleaning units, the lift motor and gearing, and the switchboard. A steel-framed brick-panelled building conforming in design with that of the retort house encloses the water softening plant.

New American Apparatus

Two new designs in gas equipment have recently appeared on the American market. The first, produced by the General Electric Company, is a new thermal gas analyzer, Type TB, for continuously recording or indicating the concentration of one component of mixed gases whose characteristics can be detected by the thermal-conductivity principle. The analyzer covers a wide range of gases and gas concentrations. It can detect impurities in hydrogen, carbon dioxide, sulphur dioxide, or any one of many organic vapours, provided the impurity has a different thermal-conductivity from that of the gas being analyzed. Gas analysis is registered on any standard indicating or recording instrument, which can be equipped with contacts for closing an alarm circuit when the concentration reaches a preset maximum or minimum value. In addition, these contacts can be used to control circuits for valves or motors in order to maintain the gas concentration within certain limits. The new instrument features high sensitivity, rapid response to gas changes, and sealed-in reference gas for reliable operation. The cell clock is thermostatically controlled to prevent temperature errors. The analyzer is mounted in a cabinet or panel and is designed for permanent installation.

The second innovation is a new and improved moulded gas meter diaphragm which has been perfected by the Vulcan Proofing Co. This new development, the result of more than seven years of research, is smooth and uniform in contour, and completely eleminates the old meter shop process of fluting and crimping. No tieing on with cord is necessary, for the new Vulcan loop comes securely attached to the rings by means of special wire, fastened without knots. The streamlined contour of the new loop forms a natural "hinge," moulded in for uniform flexibility all around the circumference. This affords more sensitive operation, reduces differential pressures and thus makes for more accurate metering.

It is claimed that this improved diaphragm virtually ends the possibility of tie leaks. The seam is vulcanized rather than stitched, affording a more positive seal at this point.

Blackpool Corporation recently asked the Ministry of Fuel and Power for permission to increase the maximum price of gas to 14d. per therm. A reply has been received that until there is evidence that costs of manufacture have become stabilized, it is inadvisable for gas undertakings to seek permanent upward revision of maximum prices.

City and Guilds Prize Awards

In connexion with the recent examinations of the City and Guilds of London Institute, the Society of British Gas Industries has made the following awards:

Gas Supply Practice.—1st prize (5 guineas)—C. F. Davey (Exeter); 2nd prize—No award recommended.

Gas Fitting.—1st prize (5 guineas)—F. A. Sandy (Westminster); 2nd prize (2 guineas)—G. A. Andrews (Westminster).

Aberdeen and Nationalization

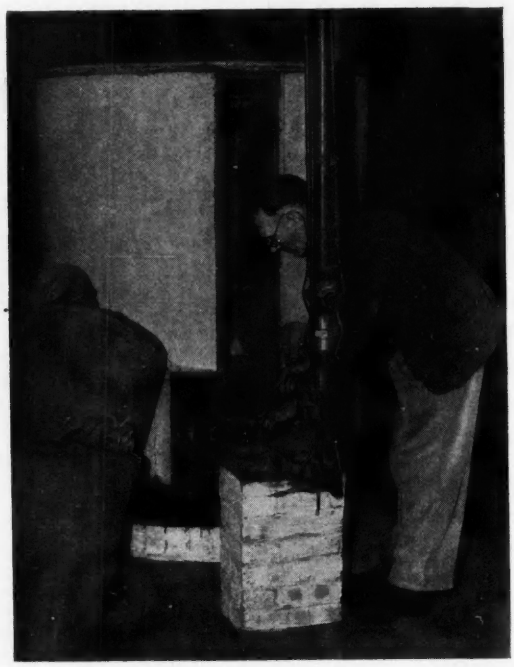
Criticism of the Government's proposed nationalization of the gas industry came from Lord Provost Sir Thomas Mitchell at a function at Aberdeen after an inspection of the city gas undertaking. "I have no time for Government Departments so far as industry is concerned," he declared. The Government, he said, would not be able to produce the gas so cheaply.

"I believe in private enterprise. The moment you stifle it you kill the goose that lays the golden eggs, because the combination of men at Westminster are not wholly capable of carrying on industries all over the country." If there had beeen any hope of fighting it, he would have fought tooth and nail against the handing over of industries to Government Departments.

"It is a very great pity that the gas-works are going out of the hands of the people who brought them up to the high point of perfection they are to-day," said the Lord Provost.

A contrasting view was expressed by Councillor Brechin, Convenor of the Gas Committee, who presided. Under their control, the Government hoped to make the Gas Industry a progressive one, he said. "What we should do, and what we are doing, is to make the works as efficient as possible and be very proud to hand them over to the Government.

Grain Drying by Gas



This year's heavy rain might have ruined the urgently needed grain crops had it not been for the efficiency of grain drying methods. The dryer pictured here is operated by gas, and has been instrumental in saving a total of 7,097 tons of grain since it was installed in a Hertford mill in 1943. The moisture extraction rate has been estimated this year at 7% in a 30% moisture content. The photograph shows an operator at the mill lighting the dryer.

The total valuation of the Buckhaven & Leven Gas Commissioners' undertaking for the current year has been fixed at £13,148, a decrease of £40 compared with last year's figure.

Wartime Distribution Developments at Perth*

By NICOL BAIRD
Engineer and Manager, Perth

(Continued from p. 613)

It should be noted that the inlet regulator to the booster plant must be set at a lower working pressure than the bell type regulator. The hydraulic regulator starts up the plant when the inlet pressure to the booster falls to the lowest figure allowable (with the booster off) in order to be sure of sufficient pressure on the districts. When, however, the booster starts up the inlet pressure will be lowered, particularly at peak loads, and this could operate the inlet regulator safety device if the presetting of both devices had not been carefully arranged.

(e) District Pressures

In view of the national development of the use of gas by both industrial and domestic consumers, there must be few undertakings which can boast of having a distribution network of pipes capable of maintaining a level pressure of gas supply at every point. As the

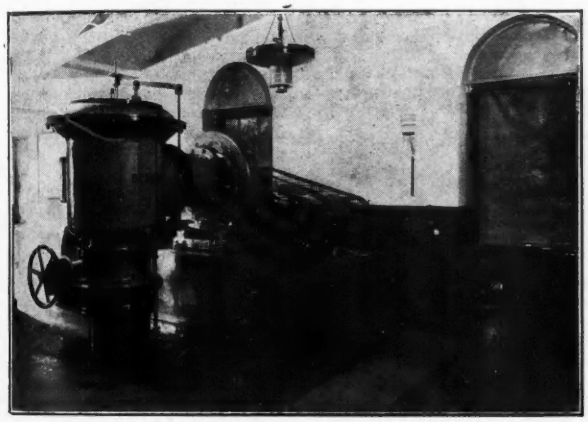


FIG. 18.—*View of Booster Plant showing Motor, Booster, Inlet Regulator, and Hydraulic Regulator*

mains have been extended and consumption increased, the pressure loss will have become more acutely apparent, since the greater the flow of gas the greater must be the pressure head to deliver the larger quantity.

In many undertakings this situation has been partially met, in recent years, by a general increase in the district pressure.

The most usual method of counteracting the inadequacy of the size of mains has been to hand-load the station governor at certain times of day, and to vary this hand-loading throughout the season according to charts taken on the districts. For accuracy this method requires quite a considerable amount of detailed work and time, and it is a method scarcely likely to produce perfect results in any case.

A description has already been given of one type of automatic station governing which eliminates the personal element and can produce throughout the whole year exceedingly good results, provided the distribution mains are not too inadequate in capacity. It will, of course, be realized that if a constant pressure can be maintained at a certain point in a district a much better average pressure will be maintained all over. The extent of the difference between the outlet pressure of the station governor and the desired district pressure does, of course, indicate that consumers nearer the station governor will normally be supplied with gas at somewhat higher and more variable pressures than is desirable. Ideal conditions can, however, only be obtained by having either a low pressure governor on each service pipe, or alternatively a governor on each gas-operated appliance.

From the consumers' point of view, generally speaking, speed of operation is one of the greatest advantages of a gas service, and it is this feature which might profitably be emphasized and augmented in the future. In other words, within reasonable limits, the consumer should always receive the greatest possible number of therms in the shortest possible time. The disadvantages of a greatly extended distribution system are to bring about, sooner or later, the realization that the most important part of an undertaking's policy in regard to the distribution of gas is not only to provide a regular pressure, but also a completely adequate pressure. The general reduction in calorific value, due to benzole extraction and poorer quality of coal presently received, have also added to the burden laid upon distribution pipe networks.

(f) Performance of Meters under Varying Pressure Conditions

Before deciding upon the most useful district pressure, one is naturally curious to learn how gas meters function at various pressures, and appended herewith will be found a series of tests which indicate that there is apparently no definite law relating the performance of a gas meter to moderately differing pressure conditions. Increased pressure apparently in some cases makes a meter slightly faster and sometimes slightly slower. On the whole the pleasing feature is the very small effect obtained in the registration of gas meters under such different inlet pressure conditions.

Actually, on a series of tests with new meters under different pressure conditions, all yielded net figures between 2 in. and 6 in. W.G. The above tests are averages of a number of experiments carried out with an assortment of new and repaired meters chosen at random. It would seem clear that provided a meter is well valved and the outlet controlled to the meter's badge capacity, then it is immaterial whether the inlet pressure is varied between 2 in. and 6 in. W.G. Even in the case of the " lights " type of meter with bag diaphragms, the difference in registration is infinitesimal, the reason being that the inlet pressure is on both sides of the valves and diaphragm. When such a meter is operating the difference in pressure represents the amount required to drive the meter, and that difference is the same, whether the inlet pressure is 2 in. or 6 in. By law this pressure absorption should not be more than 5/10ths W.G. at full capacity. If, however, the flow of gas is not restricted at the outlet, the absorption of pressure will be very much greater at 6 in. than at 2 in. W.G. If the flow of gas is increased much beyond the badged capacity of the meter the absorption of pressure to drive the meter will therefore increase, and a minute hole in the diaphragm or a hairline in the valve face will pass more unregistered gas under such conditions. In the case of bag-type diaphragms there may even be a distortion in the shape of the leathers, with the consequent alteration in their displacement, so that when using a higher inlet pressure it is extremely important that the full capacity of the meter should not be exceeded.

In this connexion it was generally accepted that the old light meter could run at up to 100% overload, but the high capacity meter is strictly designed for its badge capacity and should not be overloaded.

In other words, a high capacity meter, with its larger valves and gas ways, will behave differently from the old " lights " type of meter, and in the case of a meter with a minute leak in the diaphragm or even a speck of dust on the valve grating a tendency to slow registration will be magnified the higher the differential pressure. There is, therefore, a real risk of substantially slow registration, particularly with older meters, and yet unaccounted-for gas at Perth has actually been less in recent years since the district pressure was raised from 4 in. to 6 in. W.G.

This may be accounted for by the fact that a consumer would boil a kettle more quickly, for example, at the higher pressure, while the meter was in operation for a shorter time, and any small leakage, though passing more unaccounted-for gas at the higher pressure, would take place in a shorter time, with the consequence that the amount of gas lost is actually less!

There is an old L.C.C. Correction Table which states that 1% should be added to the meter reading for a 4 in. W.G. increase in pressure, but this table was used more than 20 years ago and is hardly applicable to the modern high capacity meter which, with pan diaphragms, well made and carefully valved, will give practically identical measurements at rated capacity, or 25% capacity, whether at 2 in. or 6 in. W.G. pressure.

On the other hand, an old " lights " type of meter fitted with bag diaphragm will probably show a variation of 1-2% slow at capacity, at higher pressures. The reason for the correction figure is probably due to the fact that when meters were tested with a fixed orifice the orifice would pass more gas at 6 in. W.G. than at 2 in. W.G. Therefore, the badged capacity would be greatly exceeded, and as the

* Paper to the North British Association of Gas Managers, Rothesay, Sept. 12, 1946.

differential pressure would increase, a slightly "slow" registration would be obtained.

A much more exhaustive enquiry would require to be made before any final recommendation could be suggested. Sufficient, however, has probably been written here to show how interesting and complex is the subject, and to suggest one direction of investigation regarding the best pressure at which to supply gas of one particular quality. In the meantime, the choice of pressure is a matter for each individual undertaking, and while it will be generally agreed that there should always be a minimum of pressure fluctuation in the district, it may well be considered that a small sacrifice in combustion efficiency is well worth the efficacy of speed, which is most frequently of paramount importance to the consumer.

PRESSURE TEST A.—100 CU.FT. ORDINARY METER

100 cu.ft. per hour			50 cu.ft. per hour			20 cu.ft. per hour		
2 in.	W.G. pressure	Net	2 in.	W.G. pressure	Net	2 in.	W.G. pressure	1% Fast
3	"	"	3	"	"	3	"	1% "
4	"	"	4	"	"	4	"	1% "
5	"	"	5	"	"	5	"	1½% "
6	"	"	6	"	"	6	"	2% "

PRESSURE TEST B.—10 LT. ORDINARY METER

60 cu.ft. per hour				30 cu.ft. per hour				18 cu.ft. per hour			
2 in.	W.G. pressure	1%	Slow	2 in.	W.G. pressure	1%	Slow	2 in.	W.G. pressure	1%	Slow
3	"	1%	"	3	"	1%	"	3	"	1%	"
4	"	1%	"	4	"	1%	"	4	"	1%	"
5	"	1%	"	5	"	1%	"	5	"	1%	"
6	"	1%	"	6	"	1%	"	6	"	2%	"

PRESSURE TEST C.—5 LT. ORDINARY METER

30 cu.ft. per hour				18 cu.ft. per hour				12 cu.ft. per hour			
2 in.	W.G. pressure	½%	Slow	2 in.	W.G. pressure	Net		2 in.	W.G. pressure	1%	Slow
3	"	½%	"	3	"	"		3	"	1%	"
4	"	½%	"	4	"	"		4	"	1%	"
5	"	½%	"	5	"	"		5	"	1%	"
6	"	½%	"	6	"	1%	Slow	6	"	1¼%	"

PRESSURE TEST D.—3 LT. ORDINARY METER

18 cu.ft. per hour				12 cu.ft. per hour				8 cu.ft. per hour			
2 in.	W.G. pressure	Net		2 in.	W.G. pressure	Net		2 in.	W.G. pressure	1%	Fast
3	"	"		3	"	"		3	"	1%	"
4	"	"		4	"	"		4	"	Net	
5	"	"		5	"	"		5	"	"	
6	"	"	1% Fast	6	"	1%	Fast	6	"		

(g) Consumption of Gas in Districts

One of the disadvantages that an Engineer tackling distribution problems generally has to meet is the lack of accurate statistical information relating to the demand for gas in various parts of the system at different times of the day, month, and year. It is not enough to know the amount of gas consumed in the whole district, and the advantages of having many inter-connexions is offset by the disadvantages of not knowing which of these inter-connexions are, and which are not, doing useful work.

This position in recent years has been aggravated by the necessity to provide medium pressure or high pressure feeder mains, boosting into the distribution network, at various points of weakness. In the circumstances being described, some interesting and informative facts were ascertained by the decentralization of the main area of gas supply into valved-off districts. Appendices II, III, and IV make it possible not only to ascertain the amount of work done by individual feeder mains, but also to assess the value of certain inter-connexions. From the appropriate chart, it is possible, knowing the amount of valve opening and differential pressure, to calculate the quantity of gas passing through each regulator, and therefore obtain a reasonably accurate indication of the consumption of gas in each district at any particular time.

As this information may be of especial interest and usefulness, a description of how the charts were compiled is appended. It will be understood that by application of the same principle similar charts relative to the working of any type of high or low pressure regulator can be constructed.

In each case there are really two separate graphs plotted on one sheet, merely for the sake of convenience. One graph, which will not present any difficulty whatever, is the curved line representing the volume of gas which passes through a regulator at a constant differential pressure of 16 in. W.G., but with varying valve openings. It would have been possible to have plotted a number of similar lines at other differential pressures, but these lines would all have converged at the point of origin, creating a certain amount of confusion and not permitting sufficient accuracy.

It will, of course, be appreciated that the flow of gas through the regulators depends on many things, such as the effect produced by the pipes on the immediate inlet to each governor, and probably also by the relative flow through each regulator. The gas flow through the governors must obviously in any case be turbulent. The graphs, which are constructed with reasonable accuracy from collected information, can, if necessary, be checked by meter readings. The main feature, however, is that the coefficients of the curves decrease as the valves open. This is the explanation why the plotted results take the form of curves and not straight lines, which would be obtained if the coefficients were uniform throughout the time gas is passing through the valve openings.

Since the volume of gas passing at any time will vary directly as the square root of the pressure difference, the second graph is a straight line. In order to utilize the full width of the chart the volume has been plotted against four times the square root of the pressure difference which, of course, again results in a straight line, since four is a constant. It also follows that the maximum volume (within the limits of these charts) is that amount of gas passing while the differential pressure is 16 in. W.G., and this quality is found on the left-hand principal ordinate which is common to both graphs.

If a line is drawn from any capacity figure indicated on the left to zero on the right-hand side of the chart, then the point where that line intercepts the ordinate representing a differential pressure measured on the appropriate scale $4\sqrt{P}$ will automatically indicate the proportion of that quantity of gas which would pass at that differential pressure. For simplicity in using the chart it is preferable to measure the differential pressure on the bottom 0 in. to 16 in. scale, rather than to endeavour to interpolate the intermediate point on the $4\sqrt{P}$ scale shown at the top of the graph paper.

The use of the chart is otherwise self-explanatory from the examples shown, but it might further be explained that the amount of the valve openings is determined by first noting the position of a point on the top of the valve spindle when the valves are tightly closed.

BRYAN-DONKIN SELF-LOADING PILOT GOVERNOR AND VENTURI

It has long been a feature of distribution practice to vary the outlet pressure of the station governor to meet the variable load occasioned in particular by meal hours, lighting, washing days, and/or Sundays. A description of one type of self-loading station governor has already been given in this Paper, together with an explanation of how the suddenly increased demand led to the introduction of low pressure boosting controlled by district regulators.

It has also been noted that, with the installation of district valves and the approximate estimations of gas passing through each regulator, the 14 in./15 in. main serving the northern district at times actually supplies more gas than the 20 in. main serving the adjacent City District.

From the outlet of the 14 in. regulator to the Northern District is a distance of 1½ miles, and the pressure loss in this particular pipeline at peak loads amounts to 4 in. W.G. This loss of pressure originally necessitated maintaining the outlet pressure of this particular regulator at 7 in. or 8 in. W.G. in order to maintain a 4 in. W.G. pressure at the central feed point to this particular district. Unfortunately at off-peak loads this additional pressure was transmitted to the inter-connected City area so long as the district valves were left open, and

this was found necessary to maintain a reasonably good pressure at one extremity of the Northern District. The "banking up" of pressure to 7 in. or 8 in. W.G. throughout both these districts during off-peak loads tended to close the City regulator. Since the bulk of the gas was actually supplied by the 14 in./15 in. main to the Northern District during such periods, this arrangement created a fluctuation between 4 in. and 7½ in. W.G. at the extreme times of low and high demand. Consideration was therefore immediately given to the elimination of this objectionable peculiarity, and it was decided that some method of self-loading should be applied to the Northern District regulator, so that the pressure at the point of feed into that district would remain as consistently as possible 6 in. W.G. pressure, irrespective of the demand.

It was obvious from the first that the application of the rolling weight principle, as applied to the Peebles governors, would not be satisfactory owing to the small movement of the pilot govenor and the varying inlet pressure. It will be appreciated that if the pressure to the inlet of a Peebles self-loading governor is consistent, then the governor will increase or decrease the pressure according to the demand, but without a differential governor before the self-loading unit, an increased inlet gas pressure would naturally tend to close the valves of the self-loading unit, and this might quite well happen at times when more gas was required.

If, however, a Venturi is fitted in the main outlet pipe from the district regulator, and the pressure at the throat of the Venturi is maintained constant by connecting the throat to the outlet of a small pilot governor, then the actual pressure in the main increases with the rising flow of gas.

There are two practical difficulties with this method of self-loading which require to be overcome. First, if it is attempted to increase the pressure in the main by an appreciable amount in a short time the velocity of the gas through the Venturi increases, due to the compression of the gas in the main, quite out of proportion to the increased demand for gas.

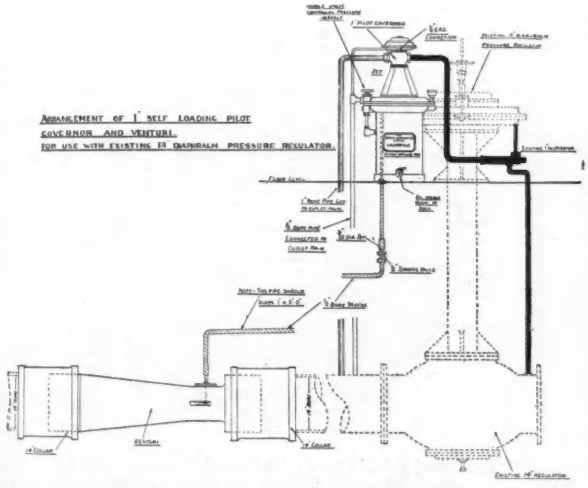


FIG. 19.—*Sectional Diagram of Bryan Donkin Self-loading Pilot Governor and Venturi*

The second difficulty is that the characteristic of the Venturi tends to give a larger increase in pressure than the corresponding increased resistance of the main under an increasing consumption, and consequently instability results. In other words, if with an increased demand for gas there is no increase of pressure at the mouth of the Venturi tube, a reduction of pressure at the throat unavoidably follows, and this tends to open the governor and to create hunting.

The method adopted to overcome these difficulties is illustrated by the sectional diagram, Fig. 19, which also shows the general arrangement of connexions of the self-loading pilot governor and Venturi designed by Messrs. Bryan Donkin to meet the requirements at Perth. A pictorial view of the arrangement, as fitted to the Northern District regulator, is shown in Fig. 20, while typical pressure charts of the outlet of the regulator and at the end of the feeder main (1½ miles distant from the regulator) are illustrated by Figs. 7 and 8, Appendix I.

The obvious means of overcoming the difficulties explained above is to limit the speed at which the pressure change can be applied to the pilot governor. It would not be possible to fit any device into the impulse pipe from the Venturi throat through the pilot governor diaphragm in order to obtain the same results, because this would make the governor extremely sluggish in action. The design of the pilot governor, therefore, has been left in its standard form, but it is fitted with a loading diaphragm supplying an increased force to the pilot governor when the volume increases. This is effected by means

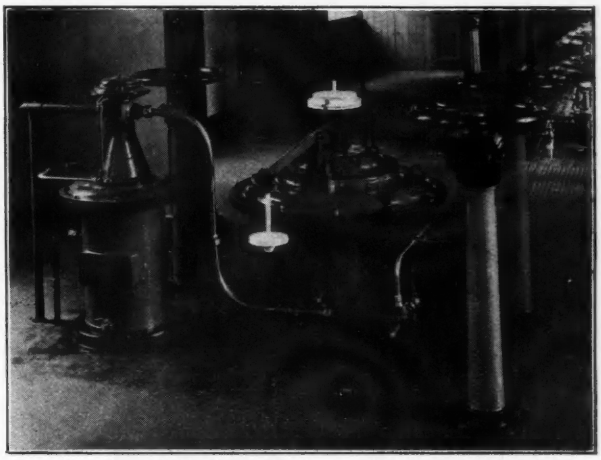


FIG. 20.—*View of Northern District Regulators showing Self-loading Pilot Governor*

of the tension spring. The effort is obtained by the difference between the outlet pressure and the throat pressure acting across the loading diaphragm. The outlet pressure acts underneath the diaphragm of the pilot governor quite normally, and the speed at which the pressure can be increased is limited by a dashpot attached to the loading diaphragm. In order to obtain an adjustment of the pressure increase a jet is fitted in the impulse pipe from the Venturi throat, and a needle valve across the loading diaphragm. Consequently, if the Venturi is capable of creating a bigger differential than is required, this effect can be reduced at will by opening the needle valve.

Normally, it is preferable to fit a Venturi tube of the same size as the main, so that the full volume of gas will pass through the throat, and the Venturi should preferably be arranged some slight distance from the governor in order to avoid the turbulence created by the governor, because this would affect the results. Since there is not a great deal of pressure difference under peak conditions, it has been considered advisable to use a small Venturi fitted in the centre of the throat of the main Venturi, so that only a small quantity of the gas will pass through that Venturi, and in this way any appreciable pressure difference will be magnified.

The self-loading by this Venturi principle, however, is only shown as a partial success because, as will be seen from the typical chart illustrated in Fig. 7, Appendix I, when the booster is put out of action by the Venner time switch the outlet pressure drops with the corresponding fall in inlet pressure, but the effect is considerably less in the Northern District, due to the interconnexion with the City District. This apparent defect can be obviated by maintaining a higher inlet pressure to the governor with the booster in operation over a more extended period.

Nethertheless, the variation in district pressure is never greater than plus or minus ¾ in. W.G., and that variation only occurs for a very limited time, approximately at midday and midnight, while for the rest of the 24 hours the maximum variation is only plus or minus ½ in. W.G. Moreover, by careful balancing of the three governors feeding the interconnected districts, the one self-loading device can effectively compensate fluctuations in the other districts. In this way full advantage is obtained of the inter-connexions between the three districts.

Since the installation of the plant reliance has been solely placed on the Venner time switch for starting and stopping of the booster. The hydraulic regulator, with mercury cut-off switch, has been under modification, and insufficient experience has as yet been obtained in the operation of this part of the plant to warrant inclusion of further information.

CONCLUSION

It is now almost five years since the arrangement of booster plant and regulators described herein was installed and put to work, and it is pleasing to reflect now that, had this development not taken place when it did, the pressure of gas supplied to the City of Perth would certainly have been extremely poor during the past few years, in view of the subsequent development of the demand out of all proportion to what had been anticipated years ago.

In spite of the many small teething difficulties which are unavoidable with a special installation to meet particular circumstances, it is, at the same time, worth commenting that the gas supply has never been interrupted during the past five years, while the pressure has never been more consistent or better in the history of the undertaking since this installation went into operation—and this, after all, is the principal criterion upon which to judge the performance and value of the scheme.

It would be invidious to conclude this Paper without acknowledging my indebtedness to the many people who have rendered assistance to me, and I wish therefore to record thanks first to our President, Mr. T. Lockhart, for affording the opportunity to read the Paper, and then to Alderman G. Clark, Managing Director of Messrs. Bryan Donkin Co., Ltd., Chesterfield, and members of his Staff for their unfailing courtesy, provision of information, and for supplying drawings and graphs as requested; to Colonel W. Carmichael Peebles, Managing Director of Peebles & Co., Ltd., Edinburgh, for helpful criticisms; to Mr. Stanley Bennet, Director of Alder & Mackay, Ltd., Edinburgh, for checking and supporting tests on meters in particular; to Mr. C. A. Poulson, of Messrs. West's Gas Improvement Co., Ltd., for helpful criticism and encouragement and for the preparation of blocks from drawings and photographs; to Mr. P. K. McLaren, of the Star Photos, Perth, for his most excellent photographic work; and to Mr. A. R. Wilson, Works Superintendent, and Mr. T. B. Livingstone, Chief Technical Assistant of the Perth Gas Undertaking, to both of whom I am deeply indebted for helpful criticism, supervision of experimental work, and enthusiastic co-operation in this, as in many other respects, during the past six years.

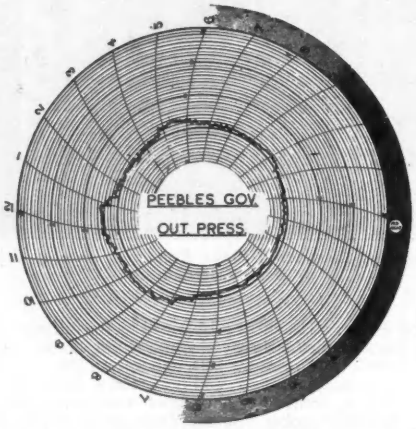


FIG. 1.—*Typical Outlet Pressure Chart—Peebles Self-loading Governor.*

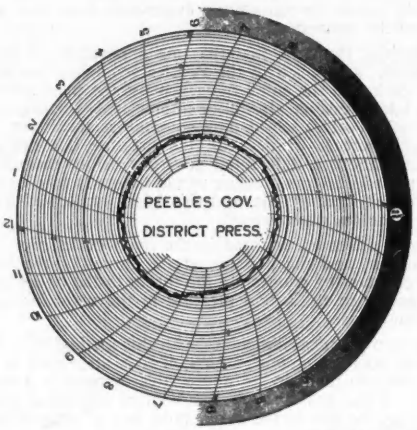


FIG. 2.—*Typical District Chart corresponding to* (1).

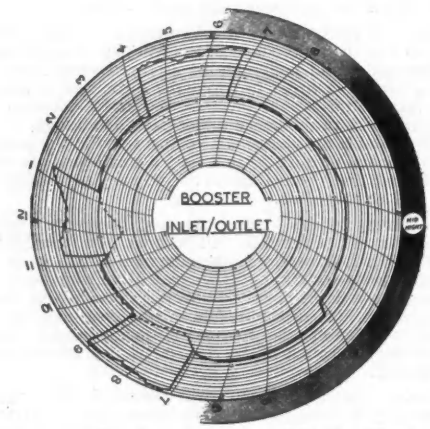


FIG. 3.—*Composite Chart of Typical Inlet and Outlet Pressures of Booster*

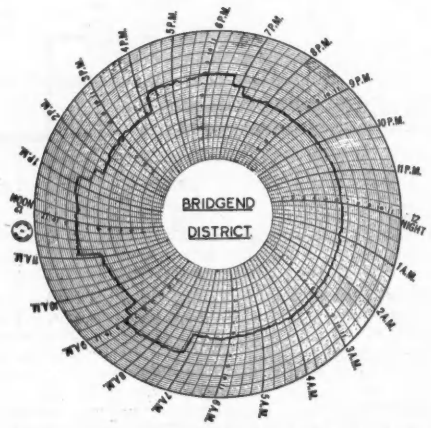


FIG. 4.—*Typical Chart of Bridgend Governor Outlet Pressures showing Effect of Clock Loading*

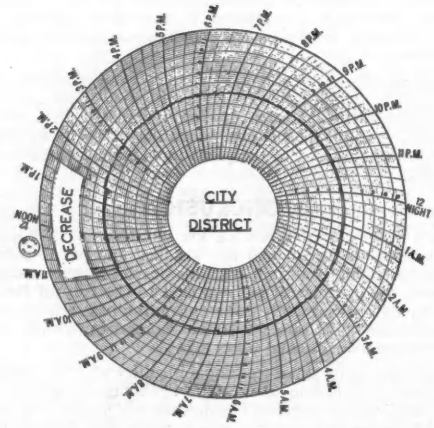


FIG. 5.—*Typical Outlet Pressure Chart—City Regulator*

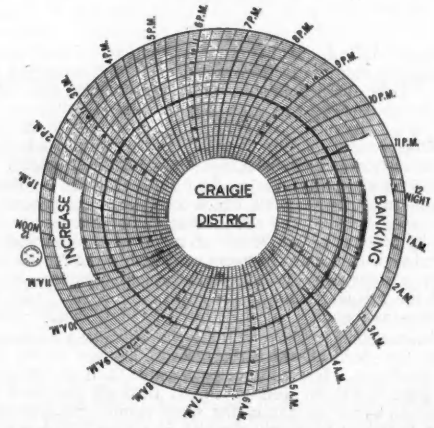


FIG. 6.—*Typical Outlet Pressure Chart—Craigie Regulator*

APPENDIX 1

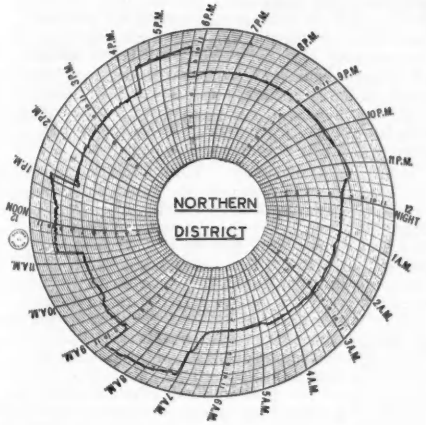


FIG. 7.—*Northern District Governor Outlet Pressures showing Effect of Self-loading with Venturi*

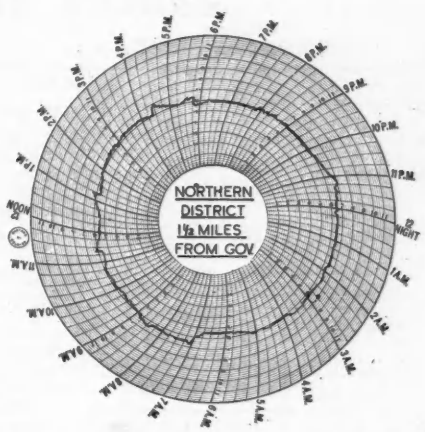
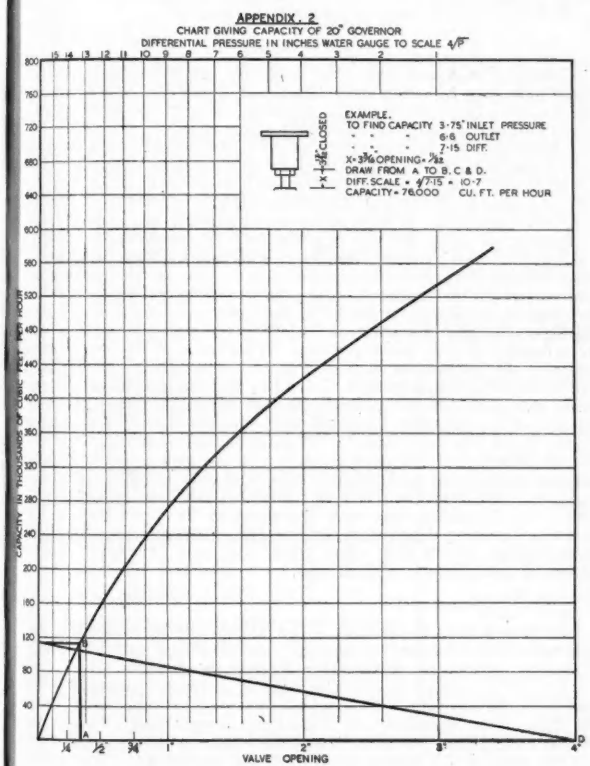
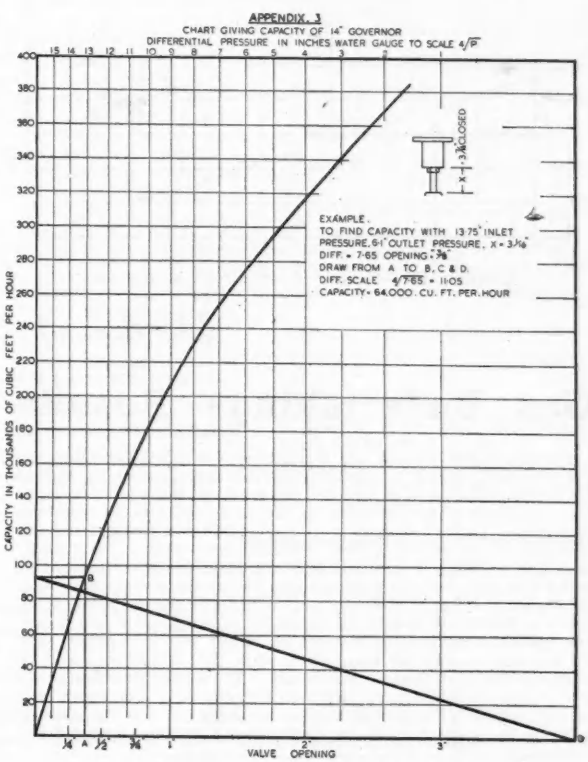


FIG. 8.—*Typical Chart of Pressures at Extremity of Northern District Feeder Main corresponding to (7)*


APPENDIX. 2
CHART GIVING CAPACITY OF 20" GOVERNOR
DIFFERENTIAL PRESSURE IN INCHES WATER GAUGE TO SCALE √P
EXAMPLE.
TO FIND CAPACITY 3·75" INLET PRESSURE
6·6 OUTLET
7·15 DIFF.
X=3/16 OPENING=7/32
DRAW FROM A TO B, C & D.
DIFF. SCALE = 4/7·15 = 10·7
CAPACITY = 76,000 CU. FT. PER HOUR
CAPACITY IN THOUSANDS OF CUBIC FEET PER HOUR
VALVE OPENING

APPENDIX II.—*Capacity Chart for* 20 *in. Regulator*


APPENDIX. 3
CHART GIVING CAPACITY OF 14" GOVERNOR
DIFFERENTIAL PRESSURE IN INCHES WATER GAUGE TO SCALE √P
EXAMPLE.
TO FIND CAPACITY WITH 13·75" INLET
PRESSURE, 6·1" OUTLET PRESSURE, X=3/16"
DIFF. = 7·65 OPENING = 3/16"
DRAW FROM A TO B, C & D.
DIFF. SCALE 4/7·65 = 11·05
CAPACITY = 64,000 CU. FT. PER HOUR
CAPACITY IN THOUSANDS OF CUBIC FEET PER HOUR
VALVE OPENING

APPENDIX III.—*Capacity Chart for* 14 *in. Regulator*

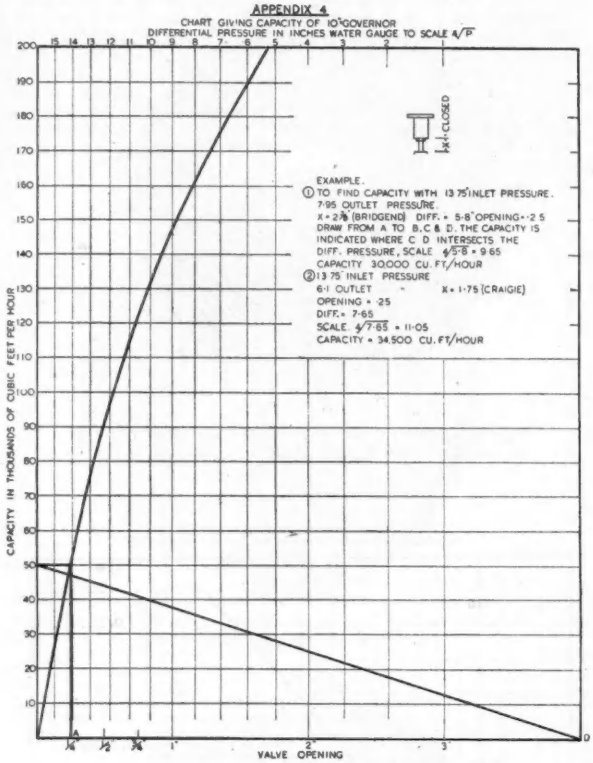
DISCUSSION

Mr. **J. M. Dow** (Paisley) said there was one answer to the Paper—all Mr. Baird's work had proved successful. The Perth undertaking had done amazing work. He was not happy, however, with regard to boosting as a means of remedying pressure faults in the distribution. It was all very well within half a mile of the works; people round that area got extra pressure but it was soon dissipated unless it was taken out to where it was most needed. He favoured high pressure feeding. There was more flexibility with the compressor. From Mr. Baird's description of the boosting system in Perth he gathered that there was no stand-by. He proposed to send in to Mr. Baird a written communication on several points raised in his Paper.

Mr. **H. S. Milne** (Aberdeen) said he shared Mr. Dow's surprise that there was no stand-by. The plant was almost entirely automatic and the provision of a stand-by would contribute to one's peace of mind. Mr. Baird had spoken of an old 14 in. main being used again and he wondered if any special precautions were taken when putting that main into commission again. He was interested in the calculation of the flow of gas through the governors but it was a laborious method of getting a continuous record of what was happening.

Mr. Baird, replying, said with regard to pressure to intervening consumers the position was that there was none. Instead of having the governor in the district they had it in their own control, virtually in their own premises. They controlled the pressure a mile and a half away. The question of stand-by had been raised. The plant that had been put in was the stand-by for the plant that was still to be installed. This would be the main plant and would be steam-driven. At the moment there was no great risk because all they did was to give an augmented service at peak load periods. With regard to diaphragm governors as against mercurial (a point raised by Mr. Milne), the latter were more expensive and they had had no trouble during the last five years with diaphragm governors. The 14 in. main referred to did not need to be purged because it had not been in use.

Wartime Distribution at Perth—Appendix IV


APPENDIX 4
CHART GIVING CAPACITY OF 10" GOVERNOR
DIFFERENTIAL PRESSURE IN INCHES WATER GAUGE TO SCALE √P
CAPACITY IN THOUSANDS OF CUBIC FEET PER HOUR
VALVE OPENING
EXAMPLE.
① TO FIND CAPACITY WITH 13·75" INLET PRESSURE.
7·95 OUTLET PRESSURE.
X = 2⅜ (BRIDGEND) DIFF. = 5·8" OPENING = 2·5
DRAW FROM A TO B, C & D. THE CAPACITY IS
INDICATED WHERE C D INTERSECTS THE
DIFF. PRESSURE, SCALE √5·8 = 9·65
CAPACITY 30,000 CU. FT/HOUR
②13·75" INLET PRESSURE
6·1 OUTLET " X = 1·75 (CRAIGIE)
OPENING = ·25
DIFF. = 7·65
SCALE √7·65 = 11·05
CAPACITY = 34,500 CU. FT/HOUR

APPENDIX IV.—*Capacity Chart for* 10 *in. Regulator*

Gas Undertakings' Results

Motherwell and Wishaw Gas Department.—Mr. W. Kirk, Engineer and Manager, states in his annual report that in the year ended May 15 the amount paid for coal exceeded the previous year's account by no less than £7,000 notwithstanding the fact that 2,000 tons less had been purchased. Deliveries were fairly well maintained, except for one period when the stock was down to three days' supply. The quantity now held in stock is approximately the same as the corresponding period last year, but this must not give rise to any complacency since the Ministry of Fuel and Power had made public the disturbing situation which faces the country in the matter of supplies for next winter. The quality over the year was slightly better and the thermal yield per ton was the best for some years, while the yield of coke and tar was approximately the same as formerly. The supply of cookers is in a worse position and a recent direction concentrating production on a limited number of approved types of cookers has had the effect of reducing to practically nil the Department's supply of simple hire cookers.

Stockport Gas Department.—An increase of 4.38% in gas sales is recorded by Mr. T. Reynolds, Engineer and Manager, in his annual report for the year ended Mar. 31, the total being 1,763,908,100 cu.ft., or 46.6% above the last pre-war year's total. The maximum day's delivery of 8,348,000 cu.ft. was 45% higher than the pre-war maximum. Heavy increases in expenditure resulted in the gross profit, at £43,266, falling £24,905 below the previous year's figure. Gas unaccounted for was 6.09% of the total make. Mr. Reynolds notes that many consumers changed from prepayment to ordinary meters during the year, probably owing to the shortage of copper coins. While prepayment consumptions increased, however, ordinary consumptions decreased. Average consumption per consumer was 29,989 cu.ft., against 29,314 in the previous year, and 24,713 in 1939. Following the removal of purchase tax from many appliances, the sale of these on hire purchase terms, suspended in 1942, was reintroduced, and this, together with the increasing flow from the appliance manufacturers accounted for an increase of 1,718 in the number of appliances sold, representing an increase of £21,914 in value. Notwithstanding the end of hostilities, industrial consumption continued to increase, the total being 528,810,400 cu.ft., which was 3.85% higher than in the previous year.

Shrewsbury Gas Light Company.—The accounts for the year ended June 30 show a profit on revenue account of £32,485, and a balance of £11,353 available for distribution. Payment of a final dividend of 4½%, less tax, making 7½% for the year, leaves a balance of £7,494 to be carried forward, against £7,384 brought in. Gas sales (1,153,029 therms through ordinary meters, and 1,198,591 through prepayment meters) showed an increase of 6.66% over the previous year. At the end of the financial year there were 12,331 consumers, comprising 3,461 ordinary and 8,870 prepayment.

Bradford Gas Department.—Mr. G. E. Currier, Engineer and Manager, records in his report for the year ended Mar. 31 a gross profit of £114,322, against £117,568 for the previous year, and a net profit of £26,992, against £49,124. Gas sales, at 11,494,789 therms, showed an increase of 0.32%, and receipts from tar, at £32,984, were up by £6,810. The year was one of extreme anxiety, due to shortage of coal, failure of the contractors to install the third carburetted water gas plant, inadequate supplies of gas from the grid of the West Yorkshire Gas Distribution Company, and a continuous rise in gas output. Further there was a shortage of coke during the winter, and great care was necessary to ensure the most equitable distribution of the tonnage available. Notwithstanding all these difficulties the Department was able to meet the requirements of its consumers. With regard to the likely financial position at the end of the current year, Mr. Currier says it is certain there will be a reduction in profit due to further increases in wages for all employees, the operation of the six-shift week for all shift workers, and to increased salaries for the staff as a result of the implementation of the Nalgo Charter.

Colonial Gas Association.—Net profit for the year ended June 30, after providing £36,000 for taxation, was £89,688. Adding to this the £5,222 brought forward and deducting interim dividends paid in April the balance to the credit of net revenue account is £53,305. The net profit was an average return of 5.9% on the share capital, plus premiums paid to the Association by shareholders. Payment of a dividend of 5% per annum on the Ordinary shares (less interim dividend of 2½% paid in April, and crediting £5,000 to reserve fund, leaves £6,700 to be carried forward to the next account. Gas sales showed a decrease of 2.2%, but the quantity sold by subsidiary gas undertakings increased by 1.3%. Inadequacy of coal supplies for Victorian requirements forced the Government to impose restrictions on the use of gas in Melbourne on three occasions during the year. The erection at the Footscray works by the Power Gas Corporation of a carburetted water gas plant of 750,000 cu.ft. per day capacity was completed and the plant put into operation. Work in progress includes the installation at Footscray of a new vertical retort house by West's Gas Improvement Co., Ltd., and the laying of a trunk main from Box Hill to Oakleigh, through which ultimately gas made at Box Hill will serve Oakleigh and adjacent areas. The annual report states that the Premier of Victoria has announced the Government's intention to introduce legislation to give power to the State to acquire certain gas undertakings now operating in Melbourne and suburbs. Although the terms of such proposals have not been outlined, the Directors view with apprehension the possibility of the Association being deprived of its Box Hill, Footscray, and Oakleigh undertakings, which over many years have been developed at considerable cost on most modern lines.

St. Helens Gas Department.—The annual report states that the gas manufactured during the past year reached a figure of 1,706,000,000 cu.ft., an increase of 13,500,000 cu.ft. over the previous year. Coal carbonized amounted to 100,824 tons, an increase of only 205 tons over the previous year. The coal bill, however, increased by £21,643. In spite of the increased cost of coal and several wages awards, the Department had a particularly successful year, partly due to an improved yield of 1.2 therms per ton of coal carbonized. The reserve fund has reached the statutory maximum amount and the maximum allowable sum of £12,000 has been carried forward to the current year. Consequently the Gas and Lighting Committee has recommended the Council to reduce the price of gas to all consumers, namely a reduction of 2½% (until further notice) for gas supplied subsequent to the final meter reading for the September quarter. The Department is now pressing ahead with a 10 in. high pressure bulk supply main to the works of the Golborne Gas Company, whose Chairman and Directors have decided to take all supplies in future from St. Helens. It is anticipated that these supplies will be in operation before the end of 1946. For the current year to date, gas delivery is up by 8%, and for the last few weeks gas deliveries are up by 20%. The latter increase is likely to establish itself as a permanent one, and in view of the fact that new works are to be built within the County Borough's gas area the Department is planning to meet many new industrial loads as well as the considerable domestic development which will be associated with various housing projects. The first estate of 200 aluminium type temporary houses is rapidly nearing completion. Many of the houses are already tenanted and the tenants are expressing satisfaction with the built-in gas kitchens, comprising gas cooker, gas wash boiler, gas refrigerator, Siesta stove, and gas poker equipment.

GAS PRODUCTS PRICES

The London Market

October 11.

So far as the prices of Coal Tar products for the home market are concerned there are no changes since the last report.

The demand is still brisk for all products.

The home demand for *Naphthalene* is such that exports have had to be drastically curtailed in order to meet it.

Home supplies of *Phenol* are insufficient to meet the demand and efforts have been made to import certain quantities from America, but the position in America seems to have changed and there are now difficulties in obtaining supplies from that source.

The home demand for briquetting *Pitch* continues good and certain quantities are also being exported to the near Continent.

It is understood that the demand for *Creosote* at home is being met and that a certain tonnage will be available for export to the U.S.A.

The Provinces

October 15

Average prices of gas-works products: Pitch, 75s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6¾d. per gallon; pure, 3s. 2¼d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by Government Orders. Prices for road tar were increased by a half-penny per gallon by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

Scotland

October 12.

Demand for all products continues steady.

*Refined Tar.** Yield to the Distiller is 5d. per gall. ex works, naked. *Creosote Oil.* Timber preserving quality,* 5½d. to 6½d. per gall.; Hydrogenation Oil,* 5⅝d. per gall.; Low Gravity or Virgin Oil,† 7½d. to 7½d. per gall. ; Benzol Absorbing Oil, 6½d. to 8d. per gall. *Refined Cresylic Acid** is 3s. 6d. to 4s. 6d. per gall. ex works, naked, according to quality. *Crude Naphtha,†* 7d. to 8d. per gall. *Solvent Naphtha.** Basic maximum prices delivered in bulk, 90/160 grade, 2s. 10d. per gall. and 90/190 Heavy Naphtha, Unrectified, 2s. 0½d. per gall.; Rectified, 2s. 4d. per gall. *Pyridine,†* 90/160 grade, 15s. per gall., and 90/140 grade, 17s. per gall.

* Price controlled. † Uncontrolled.

STOCKS AND SHARES

The recovery which commenced at the end of the previous week was continued at the opening last week. The rally was short-lived, however, and following Mr. Shinwell's depressing outlook on the coal situation and his request for fuel cuts, the previous good support finished abruptly and prices, especially among British Funds, began to react. Conditions became brighter at the close helped by the improved position in Wall Street, but there was little increase in the volume of business.

The demand for Gas Stocks and Shares also dwindled but prices remained firm and with the exception of two minor falls in the shares of companies operating abroad all the changes were in an upward direction. Gas Light and Newcastle units both hardened as did South Metropolitan and Wandsworth ordinaries, and subject to the tone of markets generally it would not be surprising to see further appreciations in this section.

The following is the full list of price changes up to Thursday last:—

OFFICIAL LIST.

Bournemouth 4 p.c. deb.	107	—112	+ 2
Commercial 3 p.c. deb.	87	— 92	+ 2
Gas Light units	20/9	—21/9	+ 3d.
Do. 4 p.c. pref.	101½	—104½	+ ½
Do. 3 p.c deb.	97	—100	+ 1
Imperial Continental	105	—110	+ 1
Montevideo ord.	120	—125	- 2
Primitiva Holdings ord.	10/	—12/	- 6d.
South Metropolitan ord.	92	— 95	+ ½
Do. 3 p.c. deb.	94	— 97	+ 1½
Southampton ord.	105	—110	+ 2
United Kingdom Gas Corpn. 4½ p.c. 1st cum. pref.	21/	—23/	+ 9d.
Wandsworth cons.	105	—110	+ 2

SUPPLEMENTARY LIST

Tunbridge Wells sliding scale	137	—142	+ 1

PROVINCIAL EXCHANGES.

Chester 3½ p.c. deb.	94	— 98	+ 4
Newcastle units	22/9	—23/3	+4½d.

Kendal Gas Department reports a net profit of £2,711 for the financial year ended Mar. 31.

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G. H. L. (Painters) Ltd.
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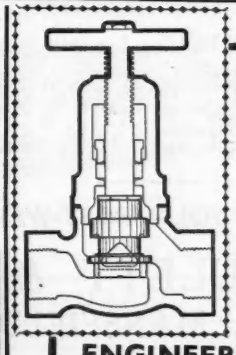
STEIN REFRACTORIES for Horizontal and Vertical Gas Retorts.

ANOTHER GAS COMPANY states on Nov. 27th, 1944:

'We are pleased to report on the satisfactory way your special Patching Cement stood up on a repair to the front wall of one of our settings. The repair was round the producer charging hole, having to stand up to the worst conditions being subject to the heat from the setting, abrasion of hot coke, and cold quenching water, and is still standing up well after three months.'

Sets like a ROCK under heat
ONX 'SUPER 83' BRAND For RETORTS
A.L.CURTIS Westmoor Works CHATTERIS Cambs.



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